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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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JOHNSTON, PHILLIP A

ART UNIT	PAPER NUMBER
2881	

DATE MAILED: 12/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/064,759	STEPHAN ET AL.	
	Examiner	Art Unit	
	Phillip A Johnston	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 August 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *11-26* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Detailed Action

Claims Rejection – 35 U.S.C. 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Pub. No. 2002/0191388 to Matveev, in view of Bleiner, U.S. Patent No. 5,923,243, and in further view of Jiang, U.S. Patent No. 6,603,507.

Matveev (388) discloses a pulsed road illuminating source of light 101 is used as a headlight of a vehicle and its radiation 110 is directed towards a direction of a vehicle movement to illuminate the road. If laser is used as a light source 101 its output may be homogenized via a fiber optic or light pipe or other such mean as known by those skilled in the art to uniformly illuminate the target area. The repetition rate of the pulses of the device 101 may be more than reciprocal time of eye inertia, preferably more than 5 Hz, although any rate can be used. The device 101 may be any type of pulsed source of light (for example: laser, pulsed arc discharge xenon lamps,

electrodeless discharge lamp, light emitting diode etc.) illuminating in the invisible for human eye spectrum about 0.19-0.45 and 0.7-5 mμm. The spectral range of road illuminating device 101 may be in any out of visible region of spectrum, but to provide high quality image it works in the region of spectrum with wavelength shorter than 5 mμm.

The trigger 102 is used to provide synchronizing pulses to activate the road illuminator 101 and the gate of image detector 107. If laser is used as illuminating device it may be, for example, the synchronizing-pulses to trigger its Q-switch element, pulsed semiconductor laser or pumping laser if it is used simultaneously with pumped tunable laser. The synchronizing pulse for trigger 102 is acquired from the synchronizing unit 103. Thus trigger 102 is connected with the synchronizing unit 103, with the road illuminating source of light 101, and with image detector 107. The device 102 is used to gate image detector 107 synchronously with light pulse from illuminator. The image of the road is captured further by an image converter 106, which may be CCD, CID or CMOS camera equipped with corresponding digitizing or analog converter. Image of the road may be observed by a driver from a display 105 connected to the image converter 106. The display 105 may be any type of display convenient in a vehicle cabin for example microdisplay, which uses OLED-on-silicon technology or head-mounted display. The image of the road on the image intensifier surface is formed by a lens assembly 108. The lens assembly 108 is constructed to be capable of projecting a sharp or in focus image.

To eliminate the glare from the oncoming traffic its source of light 101 has pulses synchronized in a way that from different groups of vehicles pulses will appear at different time zones as shown in FIG. 2. Diagrammatically, in FIG. 2 first 201, second 202, third 203 and arbitrary N-th 204 road illuminating pulses for first group of vehicles 205 are shown with respect to corresponding pulses from second 206, third 207 and N-th 208 groups of vehicles. Also direction of time 210 is shown. As seen in FIG. 2 the pulses from different groups of vehicles are shifted in time, and due to this the process of road illumination, image detection will take place also in different time zones. See Paragraph's [0083],[0084], and [0087].

Matveev (388) also discloses the use of an additional generator (second light source), triggering electromagnetic pulse with electromagnetic frequency of its radiation different in comparison with road illuminating pulse. This additional triggering pulse is generated before road illuminating pulse with predetermined and the same for all vehicles time difference. The radiation from the additional generator is directed in the same direction as laser pulse from illuminating pulsed laser.

Let us assume that two vehicles or cars #1 and #2 are moving on the road in the opposite directions towards each other. Every car has similar system for the road illumination and for road imaging. The car #1 sends two closely disposed pulses triggering 401 and illuminating 402 as shown diagrammatically in FIG. 4. Further in the text these two closely disposed pulses will be defined as double pulse. The triggering pulse is generated by the illuminator or generator of optical or RF triggering pulse 312. The electromagnetic radiation 313 from the generator 312 is aimed in the

same direction as road illuminating pulse radiation 110. When such a short (1-300 ns) illuminating pulse is used the necessity to have shifted in time triggering pulse is dictated by the fact that it is practically impossible to close the gate of image intensifier 107 immediately at the same time when blinding pulse from the oncoming car arrives. The time interval (which can be about from several nanoseconds to several microseconds) between these two pulses is predetermined and it is set exactly the same for all double pulses and for all cars. Let us say this time interval between illuminating and triggering pulse is about 400 ns. By firing triggering pulse the car # 1 produces kind of warning that in 400 ns illuminating pulse will be fired. This first pulse passing via wavelength selective filter 311 is detected by a photon or RF signal detector 310 of car #2, then sent to a synchronizing unit 303 which sent out a pulse with predetermined pulse delay. The synchronizing unit 303 is connected to generator 312, receiver of triggering electromagnetic pulse 310, and to the trigger 102. After unit 303 pulse goes to trigger 102, which closes the gate 107 of imaging device exactly at the time, when illuminating pulse from oncoming vehicle #2 arrives. The gate becomes closed only during the time equal to the illuminating pulse duration.

Diagrammatically, as seen in FIG. 4 the distance between first and second pulse is not equal to the distance between second and third pulse. Generally, when within certain period of time the distance between the double pulses for one car is different than for another, but average period is the same, they are considered as quasi-randomly generated (out-of-phase, as recited in Claim 7). See Paragraph's [0122]-[0125].

Matveev (388) further discloses that the system for pulses synchronization 303 is used to sent (for example 400 ns earlier) a pulse to the generator of triggering pulses 302 and also to acquire the triggering pulses from photon or RF signal detector 310 and transfer them to trigger 302. That means the trigger 102 produces two type of pulses: one of them to initiate the illuminator 101 and another one to gate the image intensifier 107 after receiving corresponding pulses from the system 303.

It needs to be mentioned both embodiments, indicated as first and second of this invention can coexist together and can be installed both into one vehicle and also separately into different vehicles. However, to eliminate the interference from each other they should work at different wavelengths. For example, if both system use cesium resonance ionization image detector as a gated image detector, for the first system cesium resonance wavelength 852 and for the second one 894 nm can be used for road illuminating source of light. See Paragraph's [0131] and [0132].

Matveev (388) as applied above does not disclose the use of a rearward facing light source, as recited in Claim 12. However, Bleiner (243) discloses in FIGS. 1 and 2, that two cars 1, 2 are travelling behind one another on a road 3 having a driving surface 4. The driving surface 4 is defined by the left-hand boundary marking 5 and right-hand boundary marking 6 as seen in the direction of travel of the two vehicles 1, 2. The driving surface 4 is also divided into two lanes 8, 9 by a central marker strip, represented here as a broken line. The two vehicles 1, 2 are travelling in the right-hand lane 9.

The car 1 in front is equipped with a device 10 according to the invention which is situated here in the center of the vehicle roof 11 near to the rear window 12. This device 10 and the associated laser light source 13 are thus at the same time situated in a plane of symmetry 16 formed by the longitudinal axis 14 and the vertical axis 15 of the vehicle 1. A horizontal plane of symmetry 19 (perpendicular to the former plane 16) is extended from the longitudinal axis 14 and the transverse axis 17, which like all the aforementioned axes run through the center of gravity 18 of the vehicle 1.

The laser light source 13 emits a readily visible laser beam 20 of a certain color or wavelength along an optical axis. The optical axis of this laser beam 20 is directed rearwards against the direction of travel of the two vehicles and diagonally downwards onto the road relative to the horizontal vehicle plane of symmetry 19. At point 21, the laser beam 20 hits the road 4. This point of impact 21 is situated at a distance (from the vehicle 1 emitting the laser beam) which corresponds precisely to the minimum safe distance to be observed by the following vehicle 2. Since the following vehicle 2 is situated behind the point of impact 21 shown in FIGS. 1 and 2, it is therefore travelling at a sufficient distance from vehicle 1. See Column 4, line 40-67; and Column 5, line 1-5.

Therefore it would have been obvious to one of ordinary skill in the art that the vehicular imaging apparatus and method of Matveev (388) can be modified to use the rearward facing light source in accordance with Bleiner (243), to make a following road user aware of the status of the vehicle in front of it.

Matveev (388) in view of Bleiner (243) as applied above does not disclose the use of a light source at a duty cycle less than 50% in response to the timing signal, as recited in Claims 2,8, 11 and 16. However, Jiang (507) discloses that light intensity of the light pulse usually decays when the pulse is reflected by the object and received by the gated low-light-level camera 320. Typically, its decay rate is proportional to $1/d^4$, in which d is a desired observing distance. It is similar for the back-scattering light, which is also inversely proportional to a distance to the fourth power. As a result, only those scattering lights from a short distance near the gated low-light-level camera 320 can affect the observing performance. This consideration allows a wider pulse width. If the peak power of the illuminator remains constant, the averaged illuminating power depends on the duty cycle D, which is a ratio of the emitting pulse width to the period of the light pulses. But, if the pulse width is too large, the back scattering lights from the atmosphere near the gated low-light-level camera 320 may enter the system and form the light noise. A good observing performance needs a proper pulse width so as to achieve a high averaged illuminating power without including too much light noise.

FIG. 3B is a timing sequence, schematically illustrating a timing relation between an illuminating control signal and a camera control signal. In FIG. 3B, an ON status represents an open status, and the OFF status with a low logic level represents a close status for both control signals from FIG. 3A. A proper pulse width Tp is determined by a method, which is to be described later in detail. In this timing sequence of the invention, there is no idle time shown. This means that the idle time

T_i in FIG. 2B is zero in FIG. 3B. Of course, the idle time can be nonzero if necessary. The camera control signal is identical to the illuminator control signal but has a delay of T_{2d}. If the desired observing distance is d, the gated low-light-level camera 320 of FIG. 3A is gated on with a delay time of T_{2d} =2d/c after the illuminator is turned on. The next light pulse is emitted by the pulsed active-light illuminator 310, at t=Tp+T_{2d}. The duty cycle D is defined as a ratio of Tp/(T_p + T_{2d}). The most essential parameter in this manner is the Tp, which is a quantity between point a and point b in FIG. 3B.

It is implied that the selection of the duty cycle D in accordance with Jiang (507) is equivalent to a duty cycle less than 50%, as recited in Claims 2,8, 11 and 16.

Therefore it would have been obvious to one of ordinary skill in the art that the vehicular imaging apparatus and method of Matveev (388) in view of Bleiner (243) can be modified to use the duty cycle control in accordance with Jiang (507) to improve the performance of the night vision system.

Conclusion

3. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (703) 305-7022. The examiner can normally be reached on Monday-Friday from 7:30 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor John Lee can be reached at (703) 308-4116. The fax phone numbers are (703) 872-9318 for regular

response activity, and (703) 872-9319 for after-final responses. In addition the customer service fax number is (703) 872- 9317.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

PJ

November 26, 2003